UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Ex parte RANA P. SINGH
and PAUL A. INGERSOLL

Appeal No. 2006-2050
Application No. 10/045,913

ON BRIEF

Before RUGGIERO, BARRY, and MACDONALD, Administrative Patent Judges.

RUGGIERO, Administrative Patent Judge

DECISION ON APPEAL

This is a decision on the appeal from the rejection of claims 1-10, 15-34, and 38-42, which are all of the claims pending in this application. Claims 11-14 and 35-37 have been canceled.

The claimed invention relates to a method for forming a semiconductor device structure in which first and second trenches having first and second widths are formed in a semiconductor layer. After first and second insulator liners are grown in the first and second trenches, a mask is formed over the second trench and at least a portion of the first

insulator liner is etched. Upon removal of the mask, an insulating layer is deposited in the first and second trenches.

Claim 1 is illustrative of the invention and reads as follows:

1. A method for forming a semiconductor device structure in a semiconductor layer, comprising:
forming a first trench of a first width and a second trench of a second width in the semiconductor layer;
growing a first insulator liner in the first trench and a second insulator liner in the second trench;
forming a mask over the second trench;
etching at least a portion of the first insulator liner while the mask is over the second trench;
removing the mask; and
depositing an insulating layer in the first trench and the second trench.

The Examiner relies on the following prior art:

Koike et al. (Koike)	5,578,518	Nov. 26, 1996
Lee	5,994,201	Nov. 30, 1999
Shiozawa et al. (Shiozawa)	6,245,641	Jun. 12, 2001

S. Wolf and R. Tauber (Wolf), Silicon Processing for the VLSI Era, Vol. 1, 532-33, (1986).

Claims 1, 2, 5, 8-10, 15, 19, 23-27, 29, and 32-34 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Shiozawa. Claims 3, 4, 6, 16-18, 22, 28, 40, and 42 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Shiozawa alone. Claims 6, 16, 17, 30, and 31 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Shiozawa in view of Wolf. Claims 7, 18, 20, and 21 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Shiozawa in view of Lee. Claims 38-42 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Shiozawa in view of Koike.

Rather than reiterate the arguments of Appellants and the Examiner, reference is made to the Briefs[1] and Answer for their respective details.

OPINION

We have carefully considered the subject matter on appeal, the rejections advanced by the Examiner, and the evidence of anticipation and obviousness relied upon by the Examiner as support for the rejections. We have, likewise, reviewed and taken into consideration, in reaching our decision, Appellants' arguments set forth in the Briefs along with the Examiner's rationale in support of the rejections and arguments in rebuttal set forth in the Examiner's Answer.

It is our view, after consideration of the record before us, that the Shiozawa reference does not fully meet the invention as set forth in claims 1, 2, 5, 8-10, 15, 19, 23-27, 29, and 32-34. With respect to the Examiner's 35 U.S.C. § 103(a) rejection, we are also of the view that the evidence relied upon and the level of skill in the particular art would not have suggested to one of ordinary skill in the art the invention as recited in claims 3, 4, 6, 7, 16-18, 20-22, 28, 30, 31, and 38-42. Accordingly, we reverse.

We consider first the rejection of claims 1, 2, 5, 8-10, 15, 19, 23-27, 29, and 32-34 under 35 U.S.C. § 102(e) as being anticipated by Shiozawa. Anticipation is established only when a single prior art reference discloses, expressly or under the principles of inherency, each and every element of a claimed invention as well as disclosing structure which is capable of performing the recited functional limitations. RCA Corp. v. Applied Digital Data Sys., Inc., 730 F.2d 1440, 1444, 221 USPQ 385, 388 (Fed. Cir. 1984);

[1] The Appeal Brief (Supplemental) was filed May 3, 2004. In response to the Examiner's Answer mailed July 28, 2004, a Reply Brief was filed October 1, 2004 which was acknowledged and entered by the Examiner as indicated in the communication mailed December 21, 2004.

W.L. Gore and Associates, Inc. v. Garlock, Inc., 721 F.2d 1540, 1554, 220 USPQ 303, 313 (Fed. Cir. 1983).

With respect to the appealed independent claims 1, 15, 26, and 29, the Examiner attempts to read the various limitations on the disclosure of Shiozawa. In particular, the Examiner (Answer, pages 3-5) points to the illustrations in Figures 2-9 of Shiozawa along with the accompanying description beginning at column 9, line 50.

Appellants' arguments in response assert that the Examiner has not shown how each of the claimed features is present in the disclosure of Shiozawa so as to establish a case of anticipation. In particular, Appellants contend (Supplemental Brief, pages 4-6; Reply Brief, pages 2 and 3) that, in contrast to the claimed invention, the oxide film layer component 8 of the insulator trench liner in Shiozawa, which is subject to Shiozawa's etching step, is not grown but, instead, is deposited by chemical vapor deposition (CVD). According to Appellants (id.), the Examiner has provided inadequate support for the asserted conclusion that the forming by deposition of the oxide trench liner 8 in Shiozawa can be reasonably interpreted as a formation by growing as claimed.

After reviewing the Shiozawa reference in light of the arguments of record, we are in general agreement with Appellants' position as stated in the Briefs. We find compelling the evidence presented by Appellants, in particular the excerpt from the Wolf and Tauber semiconductor processing reference book, which supports Appellants' position that the ordinarily skilled artisan would recognize and appreciate that the terms "growing" and "depositing" have distinct meanings in the semiconductor processing art.

Further, as argued by Appellants (Supplemental Brief, page 6), the specification treats the terms "growing" and "depositing" differently. When describing the formation

of the trench insulator liners (specification, page 7), a "growing" process is discussed while, when disclosing the formation of the trench insulator fill layer, a "depositing" process is described (specification, page 9). This disclosed distinction is carried through the claim language in which recites the "growing" of the trench insulator liners but the "depositing" of the trench insulating fill layer.

In view of the above discussion, it is apparent to us that, since the etched component 8 of the trench insulator liner in Shiozawa is disclosed as being deposited by chemical vapor deposition rather than being grown, all of the requirements of each of the independent claims 1, 15, 16, and 29 are not satisfied. Accordingly, we do not sustain the Examiner's 35 U.S.C. § 102(e) rejection of independent claims 1, 15, 26, and 29, nor of claims 2, 5, 8-10, 19, 23-25, 27, and 32-34 dependent thereon.

Turning to a consideration of the Examiner's 35 U.S.C. § 103(a) rejections of claims 3, 4, 6, 7, 16-18, 20-22, 28, 30, 31, and 38-42 in which the Wolf, Lee, and Koike references are separately combined with Shiozawa to address, respectively, the wet etch, dry etch, and trench rounding features of the rejected claims, we sustain these rejections as well. We find nothing in the Wolf, Lee, and Koike references, taken individually or collectively, which would overcome the innate deficiencies of Shiozawa discussed supra.

In summary, we have not sustained any of the Examiner's rejections of the claims on appeal. Therefore, the decision of the Examiner rejecting claims 1-10, 15-34, and 38-42 is reversed.

REVERSED

Joseph F. Ruggiero
Administrative Patent Judge)

Lance Leonard Barry
Administrative Patent Judge) BOARD OF PATENT APPEALS AND INTERFERENCES

Allen R. MacDonald
Administrative Patent Judge)

JFR/eld

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